SLOVENSKI STANDARD
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Izpostavljenost na delovnem mestu - Merjenje kemičnih agensov, prisotnih kot zmesi lebdečih delcev in par - Zahteve in preskusne metode

Workplace exposure - Procedures for measuring a chemical agent present as a mixture of airborne particles and vapour - Requirements and test methods

Exposition am Arbeitsplatz - Messung eines als Mischung aus luftgetragenen Partikeln und Dampf vorliegenden chemischen Arbeitsstoffes - Anforderungen und Prüfverfahren

Exposition sur les lieux de travail - Mesurage de l'agent chimique sous forme de mélange de particules aériennes et de vapeur - Exigences et méthodes d'essai

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ICS:

13.040.30	Kakovost zraka na delovnem mestu	Workplace atmospheres

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 13.040.30

English Version

Workplace exposure - Procedures for measuring a chemical agent present as a mixture of airborne particles and vapour - Requirements and test methods

Exposition sur les lieux de travail - Mesurage de l'agent chimique sous forme de mélange de particules aériennes et de vapeurs - Exigences et méthodes d'essai

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 137.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 13936:2012) has been prepared by Technical Committee CEN/TC 137 “Assessment of workplace exposure to chemical and biological agents”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

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Introduction

EN 482 specifies general requirements for the performance of procedures that methods for the measurement of the concentration of chemical agents in workplace atmospheres should meet. These performance criteria include maximum values of expanded uncertainty achievable under prescribed laboratory conditions for the methods to be used. Chemical agents in workplace air are often present in both gaseous and non-gaseous phases at the same time and therefore validated methods are required that can measure the combined concentration of the chemical agent in both phases. Examples include: processes that generate aerosols of volatile or semi-volatile liquids or solids such a paint spraying, metalworking with coolants and lubricants, acid pickling etc.; and hot processes as that generates vapours of chemical agents that are normally in the liquid or solid phase under ambient conditions, e. g. road surfacing with bitumen.

For health-related sampling of mixed-phase aerosols, it is necessary to measure the mass concentration of the inhalable fraction of hazardous chemical agents, regardless of whether they are present as airborne particles or vapour. This generally means drawing air through two or more collection media in series. If a chemical agent is collected in the form of airborne particles and it has a significant vapour pressure under ambient conditions, it will wholly or partly volatilise during sampling and the resulting vapour needs to be subsequently collected, in order that the total mass of the chemical agent is measured; similarly, the chemical agent can also be lost from the collected airborne particles after sampling if it is not stabilised.

In some cases it can also be necessary to measure the distribution of chemical agents between the particulate and vapour phases as well as the mass concentration of the inhalable fraction. For example, there can be compounds whose toxicology is known to differ significantly depending on whether they exist as airborne particles or vapour. In addition, control measures in the workplace can depend on which phase dominates. Exposure limits can be phase-specific. However the separate quantification of airborne particles and vapour is technically complex and subject to error using existing sampling technologies. For this reason this European Standard is not applicable to methods that differentiate between the sampled airborne particles and vapour.

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1 Scope

This European Standard specifies performance requirements and test methods for the evaluation of procedures for measuring a chemical agent present as a mixture of airborne particles and vapour in workplace air.

This European Standard establishes general principles to enable developers and users of mixed-phase samplers and methods to adopt a consistent approach to method validation and provides a framework for the assessment of method performance in accordance with EN 482.

This European Standard also gives guidance on approaches to sample a mixture of airborne particles and vapour and their advantages and limitations.

This European Standard is not applicable to methods that differentiate between the sampled airborne particles and vapour.

This European Standard is not applicable to a chemical agent present in different chemical and physical forms (for example, mercury in the form of Hg (0) and Hg (II)).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 481, *Workplace atmospheres — Size fraction definitions for measurement of airborne particles.*

EN 482, *Workplace exposure — General requirements for the performance of procedures for the measurement of chemical agents*.

EN 838, *Workplace exposure — Procedures for measuring gases and vapours using diffusive samplers — Requirements and test methods.*

EN 1076:2009, *Workplace exposure — Procedures for measuring gases and vapours using pumped samplers — Requirements and test methods.*

EN 1232[1)] , *Workplace atmospheres — Pumps for personal sampling of chemical agents — Requirements and test methods.*

EN 1540, *Workplace exposure — Terminology.*

EN 12919[1)], *Workplace atmospheres — Pumps for the sampling of chemical agents with a volume flow rate of over 5 l/min — Requirements and test methods.*

EN 13205, *Workplace atmospheres — Assessment of performance of instruments for measurement of airborne particle concentrations.*

EN 13890, *Workplace exposure — Procedures for measuring metals and metalloids in airborne particles – Requirements and test methods.*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1540 and the following apply.

1) An International Standard, ISO 13137, is being elaborated which it is foreseen will replace this document.

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3.1
single component aerosol
aerosol in which the airborne particles and vapour are composed of the same chemical agent

3.2
multiple component aerosol
aerosol containing more than one chemical agent, each of which can be present in the form of airborne particles and/or vapour

3.3
vapour sampler
pumped sampler or diffusive sampler that is used to collect the vapour

4 Requirements

4.1 General

Regardless of the combination of samplers used, the measurement procedure used shall comply with the requirements of EN 482 and with the requirements of EN 838, EN 1076, EN 1232, EN 12919, EN 13205 and EN 13890, as appropriate.

It is the responsibility of the manufacturer or of those who assemble mixed-phase samplers to ensure that the method complies with the requirements for expanded uncertainty under the specified laboratory conditions given in this document, including the environmental influences that can be expected to affect performance.

4.2 Sampler requirements

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4.2.1 Inhalable sampler

Measurement procedures shall specify the use of a sampler designed to collect the inhalable fraction of airborne particles, as defined in EN 481, and complying with EN 13205. The inhalable sampler shall operate at a flow rate that is compatible with that of the vapour sampler.

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4.2.2 Vapour sampler

Measurement procedures shall specify the use of a pumped sampler or diffusive sampler that complies with the requirements specified in EN 1076 or EN 838, respectively. The vapour sampler shall be capable of operating at a flow rate that is compatible with that of the inhalable sampler.

4.2.3 Mixed-phase sampler

The back pressure of the mixed-phase sampler shall not exceed the pump requirements specified in EN 1232 or EN 12919, as appropriate.

When a mixed-phase sampler comprises of an inhalable sampler in combination with one or more vapour samplers, the dead volume of the sampling train shall be kept to a minimum and any connection shall be made of an inert material that does not retain the chemical agent of interest.

NOTE When a mixed-phase sampler comprises of a vapour sampler in combination with an inhalable sampler and there are flow rate compatibility issues, it is possible to split the air flow from the inhalable sampler through more than one vapour sampler.

4.3 Pumps

Measurement procedures shall specify the use of pumps complying with EN 1232 or EN 12919, as appropriate.

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4.4 Measurement procedure requirements for mixtures of airborne particles and vapour

4.4.1 Storage test

When tested in accordance with the procedure prescribed in 5.1, the mean analytical recovery after storage shall be at least 90 %.

4.4.2 Expanded uncertainty

The expanded uncertainty of the measurement procedure as a whole, including the measurement of airborne particles and vapour, shall comply with the requirements of EN 482.

4.4.3 Method description

The method description shall contain at least the following information:

a) a general description of the principles of the method, the approach followed to sample mixtures of airborne particles and vapour and any relevant assumptions;

b) a detailed description and identification of the system components, including all collection substrates and, for commercial devices, the name of the manufacturer(s) and the product identification(s);

c) if applicable, the recommended shelf life of the collection substrate(s);

d) the design flow rate, pressure drop across the mixed-phase sampler at the design flow rate;

e) the recommended sampling time and, if applicable, the sampler capacity for a specific analyte;

f) methods for handling, transportation and storage of samples, including storage times;

g) information on analytical methods to be applied and instructions as to whether and how wall deposits are to be included in the analysis of the collected sample;

h) the recovery efficiency for specific analytes, including the effects of concentration, loading, temperature and humidity, where applicable;

i) any known interference.

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5 Test methods

5.1 Sample distribution between the collection substrate for airborne particles and the collection substrate for vapour

Set up at least six mixed-phase samplers and add a known mass of analyte to the collection substrates or, where the mixed-phase sampler includes more than one collection substrate, to the first collection substrate. The mass of analyte is calculated from the limit value and the recommended sampling volume. Add the analyte using a micropipette or syringe, if necessary, with the analyte diluted in a non-interfering solvent. Repeat for each sample loading.

Immediately after adding the calculated mass of analyte according to Table 1, draw conditioned air through the mixed-phase samplers under the following test conditions:

— relative humidity: (50 ± 5) %;

— temperature: (10 ± 2) °C and (40 ± 2) °C;

— flow rate: recommended flow rate.